HOW USEFUL IS DESIGN THINKING?
A SCHOLARLY AND EXPERIENTIAL CRITIQUE

Madeline Michelle Goulet

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Carma R. Gorman, Ph.D.
School of Design and Creative Technologies
Supervising Professor

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Assistant Dean Doreen Lorenzo
School of Design and Creative Technologies
Second Reader

Abstract

Author: Madeline Goulet

Title: How Useful is Design Thinking? A Scholarly and Experiential Critique

Supervising Professors: Carma R. Gorman, Ph.D., Assistant Dean Doreen Lorenzo

The term “design thinking” has become a buzzword and is routinely touted as a panacea for all ills in business, engineering, technology, and more. I’ve become curious about how and why “design thinking” has become such a fashionable creative problem-solving methodology in business and academia today, especially in the United States. But what is it? And how did it come to be? Can it be applied to everything? And if not, in what situations or settings is design thinking useful?

Design thinking is a creative problem-solving methodology modeled on the way that designers have traditionally solved creative problems. The goal is to yield human-centered, and therefore better products and services that improve the human experience. Design thinking, the methodology is commonly conflated with design, the discipline. However, design thinking is a method that can be used by anyone who learns the methods, whereas design is a craft or an art that cannot be reduced to a formula, and requires years of study to do expertly.

In my work, I define the essence of what design thinking is, define the crucial steps, and explain some of the variations. I also synthesize perspectives on the strengths, weaknesses, and limitations of design thinking from various design professionals and design thinking advocates. Lastly, I synthesize a timeline of events, people, and movements that relate to design thinking in order to explain how and why it became the popular buzzword it is today.

Keywords: design thinking, human-centered design, creative problem-solving, participatory process, design science, wicked problems

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Introduction

In my coursework for the Bridging Disciplines Program in Design Strategies, I have become well-acquainted with design thinking methodologies through readings, reflections, and especially hands-on design projects. However, from the time I walked into my Introduction to Design Thinking course to the end of the semester in the Capstone in Integrated Design course, my perspective on and expectations for design thinking have shifted dramatically. At first, I did not trust the process. In class, we were repeatedly told to refrain from jumping to solutions before conducting user research and synthesizing the findings, but I was constantly racking my brain for creative solutions to the design problem, in case our group project fell through, as group projects often do. I lacked trust in my team and in the design thinking process as a whole.

But to my surprise, at the end of the user research phase in my first design project, my team and I were standing around our four-by-eight-foot Gatorfoam board filled with carefully grouped, color-coded sticky notes and the ideas started flowing. I was shocked. These were not the same breed of ideas that I had stored in my head for when I thought the project would inevitably take a turn for the worse. These ideas were truly creative and were derived from the combination and collaboration of the skills and expertise represented on the team. These talents included Philosophy, Music, Architecture, and Radio-Television-Film. We eventually arrived at a unique and clever solution that we prototyped and iterated upon until our final presentation. After giving the final presentation for the Introduction to Design Thinking course, I remember feeling the greatest sense of accomplishment that I had felt up to date during my time at The

University of Texas. I was proud of my team, proud of our solution, and proud of myself for having given the process and my teammates a chance to do their work.

But I've also become curious about how and why "design thinking" has become such a fashionable creative problem-solving methodology in business and academia today, especially in the United States. The term "design thinking" has become a buzzword and is routinely touted as a panacea for all ills in business, engineering, technology, and more. But what *is* it? And how did it come to be? Can it be applied to everything? And if not, in what situations or settings is design thinking useful?

Design thinking is not new: it has been around forever under different names, as it is basically a schematization of how people in creative industries have traditionally solved problems. But design thinking is *not* design. (One of the reasons that discussions about it are so muddled is that the name encourages people to conflate the two.) Recently, consulting firms have repackaged designers' creative problem-solving methodologies as a prescriptive formula that businesses can use with success in industries and fields that have less of a creative focus than design. But because consulting firms have profitably commodified their own versions of the general methodology, they have incentives to sell their proprietary versions of design thinking to clients, even to solve problems that it's not suited to solving. Design thinking is not an effective methodology for solving *every* kind of problem, and despite the claims of many of its proponents, using design thinking methodologies does not guarantee good results: that depends more on the quality and chemistry of the people on the team, and their commitment to following the process in an earnest manner rather than just going through the motions.

What is Design Thinking?

Is design thinking a methodology? A theory? A process? A practice? A technique? An approach? Though people do not agree on a single definition for design thinking, at its core, I would describe it as a problem-solving methodology or process for solving complex problems that do not have one scientifically true answer. The solutions it yields are intended to be innovative and based upon human needs, which is why some people use the terms "design thinking" and "human-centered design" synonymously. But I would argue that human-centered design is the *product* of using the design-thinking *process.* Design thinking is best described as a *process* or a *methodology*, because despite their many variations, all design thinking methodologies describe and prescribe a series of steps to be carried out to solve a problem. There are many different ways of performing each step in the process, and of describing and naming these steps, as many businesses have created their own unique variants of the process (which arguably contributes to the cloudiness of the term).

How Did Design Thinking Come to Be?

Design thinking is not new. Design thinking methodologies have always existed, because designers have been designing for other people, and have been trying to solve problems, for a very long time. Design thinking has grown widely popular largely because businesses have started to package it and sell it. But it started well before this and it grew out of a need for a more scientific process for solving problems across multiple disciplines.

Over the years, many people have attempted to make the field of design more "scientific," have created methods for designing things, have stressed the need for planning in design, and have advocated for human-centered design approaches in fields such as design, engineering, and business. Design thinking is different from these earlier efforts, if at all, only because it encompasses all of these concepts and spans all of these different fields.

Design Thinking is Not New

Indeed, the most widely voiced objection to design thinking is that it brings nothing new to the table and is merely a trendy name for an old practice. In *The Design Way*, authors Harold G. Nelson and Erik Stolterman point out how design thinking is evidently trending: "The market overflows with workshops and training sessions that promise to provide the right sequence of learning experiences leading to easily accessible, and cost-effective problem-solving skills" (Nelson & Stolterman, 2014: 29). But the question stands: is design thinking a trend or is it here to stay? Don Norman, author of the acclaimed *The Design of Everyday Things* notes how design thinking is not a new way of thinking, nor is it any different from the way any creative person thinks. He calls design thinking "a public relations term for good, old-fashioned creative thinking" (Norman, 2010). Norman further addresses how design consultancies package and sell design thinking by saying that the primary value that they are providing the client is the fact that they are "outsiders," and for that reason alone, they are able to breathe new ideas into the client's business (Norman, 2010). Despite all of this, Norman applauds the spread of the term "design thinking" for all

of the work it has done for the design community. He writes, “It will help in the transformation of design from the world of form and style to that of function and structure...When this transformation takes place, the term can be put away to die a natural death. Meanwhile exploit the myth. Act as if you believe it. Just don't actually do so” (Norman, 2010). Design thinking may be a trend and may not be introducing anything new to the world, but it is reintroducing creative thinking and problem solving to non-creative fields, and for whatever that is worth, it should be celebrated as a victory.

Design was at one point a field that most professionals and scholars grouped closer to the fine arts than to the sciences. The process of design was understood as more of a matter of genius and inspiration, rather than a matter of rationalization and science. While some still treat design as such, there has certainly been a shift to scientize design. The formation of the Design Research Society in 1966 and its first publication of the journal *Design Studies* in 1979 were landmarks in this “scientization” of the field of Design. Furthermore, in order to bring design closer to the sciences, the field needed a replicable method. And I argue that design thinking is the new name for the “design science” of the mid-twentieth century, which was modeled on the scientific method to lend the field greater credibility.

Design Thinking was Derived From a Scientifically Driven Method

Without a method of proving how a creative solution comes to light, other than alluding to having an “eye” or a “gut” feeling, it is often difficult to justify creative solutions. Design thinking likely came from creative (and non-creative) people’s need for a

more-scientific method that they can use to justify every step of the process, and therefore the end result, giving more credibility to the creative fields. In *The Design Way*, Nelson and Stolterman discuss a fundamental flaw in how society has viewed the division between thinking and making for centuries. As Nelson and Stolterman observe, "In Plato's Republic, those who *thought* about things were elevated to the pinnacle of society, while those who *made* things were positioned at the bottom of the social hierarchy" (Nelson & Stolterman, 2014: 15). This echoes the divide between the humanities and design. This societal divide is seen in modern day divisions within the workforce, as well as within educational institutions. Universities are traditionally viewed as places of *thought* where high-achieving students go to learn theory and participate in rich discussions among their peers, while trade schools or vocational schools are viewed as places of *making*, where lower-achieving students are taught specific crafts in order to make a living. In this sense, craft has arguably been inappropriately devalued for many years.

The design thinking methodology developed because people in creative fields such as architecture, design, and city planning needed a logical, scientifically driven planning method, similar to the scientific method, that they could use to justify their proposed solutions to creative problems that would never be able to yield a single true answer or solution. Being able to spell out a logical rationale for the creative decisions one makes leads to solutions that are easier to defend to clients and detractors. The steps of design thinking closely resemble the steps of the scientific method. Below you will see the five steps of the scientific method in comparison to the six essential steps of the design thinking method.

Comparison of the Scientific Method to the Design Thinking Method

Scientific Method	**Design Thinking Method**
Observation	Problem Definition
Ask Questions	User Research
—	Synthesis
Form a Hypothesis	Ideation
Conduct an Experiment	Prototyping
Accept/Reject Hypothesis	Iteration

Design thinking is not meant to be as explicitly scientific as the scientific method. The point of design thinking is first, to learn as much as possible about the users and the problem in order to enable human-centered design, just as the first steps of the scientific method are to "observe" and to "ask questions." In both methods, one is to reserve any assumptions prior to the research. Then, in the ideation phase (or hypothesis phase in the scientific method), one identifies the *hypothesis* that is to be tested in the "prototyping" phase in design thinking or the "conduct an experiment" phase in the scientific method. In the prototyping phase of design thinking, there are not often any constants or variables, as there would most likely be in a scientific experiment. From there, both methods call for iteration on the hypothesis until the hypothesis is proven *true* (in the scientific method), or *real* or *satisfactory* (in design thinking).

The methods of design thinking are scientific in the way that the solutions are based on evidence rather than intuition, in an effort to increase the credibility of the design professions. The scientific method can be used by scientists and non-scientists, just as

design thinking method can be used by designers and non-designers. Both methods should come intuitively to any scientist or designer, as this is the way they are taught to approach problems, but both methods are also accessible to lay-people who wish to engage with a scientific problem or a design problem.

Another major difference between science and design is that science is all about finding what is true, while design is about finding what will suffice. In *The Design Way*, Nelson and Stolterman address exactly how design questions differ from scientific questions. They write, "We do not accept as a scientific truth a statement that sometimes is true, and sometimes not. Science deals with what is general and universal" (Nelson & Stolterman, 2014: 30). They compare the idea of truth and universality to the reality of the design approach. They note how design deals with "ultimate particulars." Then, they go on to explain this term, "The outcome of a specific design process, such as a chair, a curriculum, or a policy, is an ultimate particular. It is something unique. It is not the universal chair, the universal curriculum, or the universal policy" (Nelson & Stolterman, 2014: 31). In design, there is a focus on particulars, and all of the particulars culminate into what is reality. Design strives for the "ultimate particular," which satisfies maximum particulars given the complexity of reality. *The Design Way* continues in explaining the complexity of what is real by writing, "We are quite certain that there is little chance of someday discovering the 'right' answers to the question of what kind of world we ought to have created" (Nelson & Stolterman, 2014: 28).

In 1969, economist Herbert Simon (1916–2001) published *Sciences of the Artificial*, where he makes a distinction between design and science: "The natural sciences are

concerned with how things are...design, on the other hand, is concerned with how things ought to be" (Simon, 1968, 114). He identified the primary goal of a design approach to be "satisficing" rather than optimizing and identified rapid prototyping and testing through observation to be key to this approach (Simon, 1968, 28). Satisficing is the art of making the best decisions with the information available. There is an infinite amount of data that one can collect, but time is always a limiting factor. Therefore, one must satisfice with the available findings and move on to solving the problem with that available information.

As early as the 1920s, professionals in the fields of art and design began to discuss the need for scientifically designed products and systematized innovation. In 1923, Theo van Doesburg (1883–1931), the Dutch artist best known for De Stijl movement, wrote *Toward a Collective Constructive*, where he states:

> Our epoch is hostile to every subjective speculation in art, science, technology, etc. The new spirit, which already governs almost all modern life, is opposed to animal spontaneity, to nature's domination, to artistic flummery. In order to construct a new object we need a method, that is to say, an objective system (van Doesburg, 1923).

Fields that had traditionally been thought of as merely art, such as such as the fine arts and architecture saw a shift in thinking and practice where there was more of a push for rationale and methodologies put in place in order to plan out the finished product. The search for an objective, scientifically grounded, rational approach to art, design, and architecture continued to gather momentum through the 1920s and 1930s.

The Swiss-French architect, Le Corbusier (1887–1965) began to treat his architectural designs more scientifically as opposed to purely emotionally, as art and design had traditionally been approached. He recognized the importance of objectivity and

rationality in designed objects, and more specifically in the context of architecture. In *Toward an Architecture*, he famously wrote, "Une maison est une machine-à-habiter," which translates to: "A house is a machine for residing" (Le Corbusier & Cohen, 2009). He believed that the activities performed in the home should dictate its form, rather than forcing the activities into a conventional rectangular form. In 1929 at the Second International Congress for Modern Architecture in Munich, Le Corbusier remarked: "The use of the house consists of a regular sequence of definite functions. The regular sequence of these functions is a traffic phenomenon. To render that traffic exact, economical, and rapid is the key effort of modern architectural science" (Le Corbusier, 1929). Le Corbusier recognized a need for science to drive the strategic decision-making in architectural design. Design thinking grew its scientifically driven roots in this era and from leaders like Theo van Doesburg and Le Corbusier.

The 1960s were commonly referred to as the "design methods movement," or the "design science decade" as design theorist and inventor, Buckminster Fuller (1895–1983) dubbed it (Dam & Siang, 2018). Fuller defined design science as, "the effective application of the principles of science to the conscious design of our total environment in order to help make the Earth's finite resources meet the needs of all humanity without disrupting the ecological processes of the planet" (Brown, Cook, & Gabel, n.d.). Other protagonists during this era included designer John Christopher Jones (b. 1927), design theorist Horst Rittel (1930–1990), engineer Bruce Archer (1922–2005), and architect Christopher Alexander (b. 1936) (Sultan, 2017). Fuller promoted design science as a method to combat the looming environmental problems in light of the increased industrial capacity as a result

of WWII. He believed that these problems could not be solved by politicians and economists alone, but rather, required a collaborative and multidisciplinary effort (Cross, 2001, 50). The decade of the 1960s is when people began developing the field of design into a science, creating a method for design modeled off of the scientific method.

Design Thinking Came From a Need to Tackle "Wicked" Problems

At a point in time, before the field of design existed, design was happening and complex systems were built around humans. Design was big. And then some years later, the defined field of design was minimized to pertaining to "aesthetics, image, and fashion," as Tim Brown says in a 2009 TED Talk (Brown, 2009). But perhaps design thinking brings design back into something bigger. Brown writes:

> Who would have thought, when the first industrial designers hung out their shingles, when the first graphic designers laid out a printed page, when the first generation of digital designers grappled with the mysteries of the Internet, that by virtue of their unorthodox training and their frequently anti-establishment practices, they would also one day have a major role to play in addressing challenges so urgent and complex? But that is exactly what has happened, and we are now face-to-face with the biggest challenge of them all: to redesign design to meet these needs (Brown & Katz, 2019).

These bigger design problems include the healthcare system, the education system, security, and re-orienting consumption and carbon emissions to address climate change.

In the 1960s, in the aftermath of World War II, the movement for more objectively and rationally driven design continued, and professionals in fields such as architecture and engineering needed a scientific design *process* that could be applied to solve problems that spanned single fields. In addition to focusing on a process, these professionals needed a way for collaboration and convergence of disciplines around the field of design in order to

quickly problem-solve for a breed of problems that engineers, architects, and designers were suddenly being called to solve, but could not solve alone. These problems would later be dubbed "wicked problems" in the 1970s by Horst Rittel (1930–1990) and Melvin Webber (1920–2006).

The 1962 Conference on Design Methods in London was instrumental in launching a second wave of discourse regarding how to approach design. Designers were concerned with how to address problems, and the process that they were trying to define would need to be more research-driven (Cross, 2001: 49). Following the conference, architect Christopher Alexander wrote a book titled *Notes on the Synthesis of Form* in 1964, where he explored the new nature of problems that designers were facing and how to solve them. He writes: "Today more and more design problems are reaching insoluble levels of complexity. This is true not only of moon bases, factories, and radio receivers, whose complexity is internal, but even of villages and tea kettles. In spite of their superficial simplicity, even these problems have a background of needs and activities which is becoming too complex to grasp intuitively" (Alexander, 1964: 3). He proposed that these problems call for information that is more widespread than a single field (Alexander, 1964: 4). Design research and collaboration between disciplines grew from this period.

In 1973, Horst Rittel and Melvin Webber coined the term "wicked problems" in the essay "Dilemmas in a General Theory of Planning" to describe the breed of problems that designers were facing in the fields of engineering, architecture, city planning, and so on. He wrote, "We use the term 'wicked' as a meaning akin to that of 'malignant' (in contrast to 'benign') or 'vicious' (like a circle) or 'tricky' (like a leprechaun) or 'aggressive' (like a lion,

in contrast to the docility of a lamb)" (Rittel, 1973, 160). He then goes on to identify ten characteristics of wicked problems:

1) There is no definitive formulation of a wicked problem;
2) Wicked problems have no stopping rule;
3) Solutions to wicked problems are not true-or-false, but good-or-bad;
4) There is no immediate and no ultimate test of a solution to a wicked problem;
5) Every solution to a wicked problem is a 'one-shot operation'; because there is no opportunity to learn by trial-and-error, every attempt counts significantly;
6) Wicked problems do not have an enumerable (or exhaustively describable) set of potential solutions, nor is there a well-described set of permissible operations that may be incorporated into the plan;
7) Every wicked problem is essentially unique;
8) Every wicked problem can be considered to be a symptom of another problem;
9) The existence of a discrepancy representing a wicked problem can be explained in numerous ways. The choice of explanation determines the nature of the problem's resolution;
10) The planner has no right to be wrong (Rittel, 1973, 161-167).

These complex problems that Rittel describes became of interest after World War II and are the problems that designers of all types were beginning to attempt to find an approach to solve. Wicked problems, such as economic and environmental issues, all had many angles rooted in many different areas and required a high degree of collaboration from professionals from different fields and perspectives.

In 1992, Richard Buchanan returned to the concept of wicked problems in his essay titled "Wicked Problems in Design Thinking." He argues that design should be considered the new "liberal art" of the modern day because it requires integrative thinking and cooperation between multiple disciplines, it allows the designers to engage with the ever-changing world by the making of things, and because of its ability to humanize technology and shape culture (Buchanan, 1992). He also goes into detail about how some,

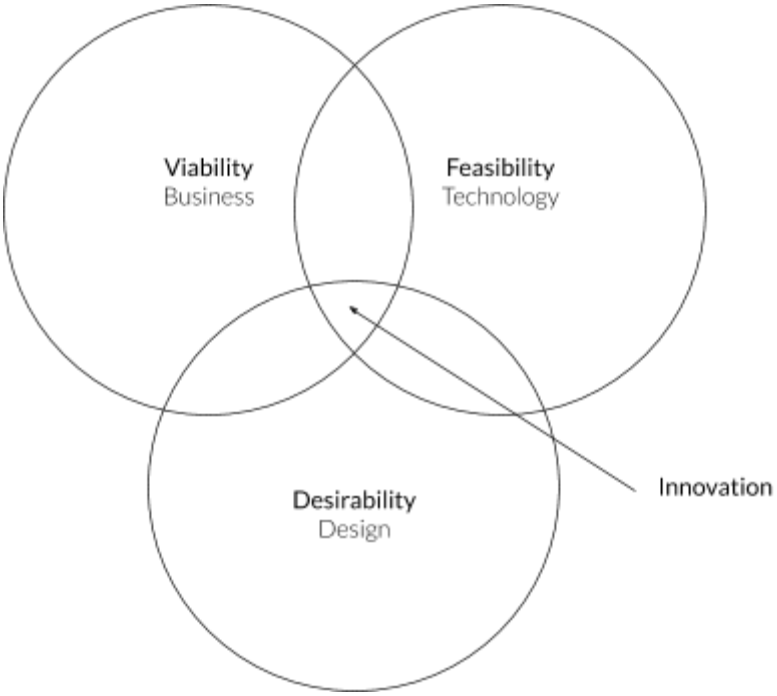
but not all design problems are indeterminate and wicked. He encourages holistic and collaborative efforts when approaching design problems.

In 2004, Stanford University opened the Hasso Plattner Institute for Design, commonly referred to as the d.school. Stanford was the first to formalize design thinking in the realm of education. The d.school focuses on problem solving for "wicked" problems. The four guiding principles for how the d.school functions are radical collaboration, real-world projects, unbounded problems, and a 100% opt-in culture (Hasso Plattner Institute of Design at Stanford University). Furthermore, the d.school has eight core abilities that they strive to instill in their students: (1) navigate ambiguity, (2) learn from others, (3) synthesize information, (4) experiment rapidly, (5) move between concrete and abstract, (6) build and craft intentionally, (7) communicate deliberately, and (8) design your design work (Hasso Plattner Institute of Design at Stanford University). These abilities align with the goals of design thinking and are strengthened and practiced through engaging in project-based design problems.

Design Thinking Facilitates Collaboration

As mentioned previously, design thinking is a tool that can be helpful to both designers and non-designers. Design thinking provides a framework for non-designers to adopt the designer's mindset. Tim Brown notes: "Design thinking reaches beyond the hard-won skills of the professional-trained designer and should be available to anyone who wishes to master its mindsets" (Brown & Katz, 2019). This mindset is meant to be creative and innovative, and therefore is expected by its adopters to break down the typical

thinking in various professions such as engineering, business, and social sciences. Design thinking also provides collaborators from across disciplines with a shared vocabulary. Jon Freach, current Lecturer at the School of Design and Creative Technologies at The University of Texas at Austin, and former Executive Director of Design Research at frog talks about how design toolkits provide a shared language to use as a mediator between the design disciplines and business industry. (Freach, 2018). Having a shared vocabulary is a tool for collaboration, and therefore the makeup of a design thinking team is crucial. Below is a commonly referred-to Venn diagram that illustrates the three necessary perspectives on a design thinking team.



Design thinking advocates have popularized the above chart that claims that innovation lies at the intersection of business, technology, and design. Design thinking proponents encourage having a robust team of individuals who come from different backgrounds, but who at a minimum represent the fields of business, technology, and

design. Design thinking has been a lucrative addition to consulting companies' portfolios of services. So, when IDEO was founded in 1991 by David Kelley, Bill Moggridge, and Mike Nuttall as a merger of two companies, other design-centric companies caught on. IDEO brought the concept of design thinking to the business world and was one of the first to package the process of design thinking as a business strategy. IDEO was unique for its time because it employed professionals from many different educational backgrounds and formed interdisciplinary teams of thinkers to approach design problems. According to the prescribed IDEO design thinking methodology, the business perspective is responsible for answering: "What is likely to become part of an [economically] sustainable business model?" The technology perspective is responsible for answering: "What is functionally possible within the foreseeable future?" And the design perspective is responsible for answering: "What makes sense to people and for people?" (IDEO, 2018). In the many versions of design thinking by IDEO and other design consulting firms, advocates say that design thinking sets up the structure for working on problems with teams that are interdisciplinary and collaborative and for this reason, they claim that the solutions end up being viable, feasible, and desirable.

Design Thinking is Human-Centered at its Foundation

Among the various design thinking methodologies, users are included in the design process, when performed correctly. Design thinking is intended to produce human-centered design. Therefore, the methods should include users throughout the entirety of the process, similar to what is known as the "participatory approach" or

"cooperative design." Coinciding with the 1960s, the Scandinavian approach to design began to influence the conversations on design throughout the rest of the western world. The participatory approach actively involves the users in developing products to ensure that user needs are met in the final outcomes (Sanders, 2008: 3). The basis of the participatory process is to include the public in the development of their physical environment in order to create a strong dynamic of collaboration and communication between the public, the local municipalities, and the stakeholders (Danish Ministry of Culture, 2014: 9). In doing this, the public is involved in the decision-making and development of the spaces and services that they will inhabit and utilize, which ensures that the public will be satisfied, proud, and responsible for the spaces that surround them. When the public is involved in the development of their shared spaces, they then feel more of a responsibility to maintain their surroundings and the process increases human interaction. The concept of a human-centered focus in design was a part of earlier attempts to design based on human needs. However, the concept of human-centered design continued to develop.

Several design thinking critics have pointed out the fundamental flaw of design thinking in that the design thinking practitioner has unchecked powers and is often blindsided by their own privilege. Design educator Lucy Kimbell explains how in design thinking, the designers play less of the role of the maker and more of the role of "cultural intermediaries" (Kimbell, 2011: 287). This is a large responsibility that design professional and design educator Jared Huke explains the dangers of: "Just like giving everyone a scalpel doesn't make us all surgeons, giving us all Post-its doesn't make us the right people at the

right time to make the right product, observe the right users, and capture the right insights" (Huke, 2018). As many institutions in the business and education realms continue to empower more professionals and students with design thinking methodologies, these warnings of overstepping in the process must be broadcasted. Huke further points out how design thinking is flawed because of the way it self-validates. He writes, "This approach glosses over the fact that the person sent out for a couple of interviews in a conference room has no training in how to calibrate for inherent bias in being both a data gatherer and a data interpreter" (Huke, 2018). Furthermore, Design educator Amy Collier expresses her worries pertaining to the privilege that many design thinking practitioners fail to acknowledge:

> Design thinking can feel like colonialism. Enter privileged White people to impose post-it note solutions on our community's problems. Beyond obscuring or under-recognizing structural inequities at the heart of problems, and beyond not requiring problem-solving enthusiasts to see their own privilege, it may create new problematic power dynamics rather than helping address the liberatory needs of populations oppressed by structural inequities (Collier, 2017).

However, she concedes that as more participatory practices are adopted into the design thinking process, this flaw may become corrected. She argues that because design thinking still exists in a realm of privilege, which in turn means that the outcomes will likely favor those who are privilege, there must be greater efforts to truly adopt human-centered, participatory practices in order to overcome this privilege bias.

In the user research phase the designers have the opportunity to learn from the users by observing their experiences firsthand through contextual interviews and observation. Furthermore, throughout ideation, prototyping, and iteration, the users should be invited to join the design team (typically in exchange for some sort of

compensation) in coming up with ideas, testing solutions, and providing feedback on how to iterate and improve. It is in these stages that the design thinking team has the greatest opportunity to practice the "participatory process" with users. In these phases, the users should be elevated to the role of co-creators, in order for the most successful, human-centered solutions to be discovered.

Design thinking advocates argue that design thinking methods can be applied to nearly any issue, if the team is endowed with the correct set of expertise. Tim Brown writes, "Schools, no less than sunglasses, street signs, or electric scooters, are designed—and like any other artifact of our civilization, they may be designed well or poorly, or may simply have been designed to meet challenges that are no longer relevant" (Brown & Katz, 2019). This is why more businesses and schools are turning to design thinking methods to transform their operations. The methods are prescriptive, yet adaptable to many problems, which is why Brown notes that anything from street signs to school systems are ripe for innovation.

One particular success story using that yielded a human-centered product is at a local Texas supermarket chain. The supermarket, H-E-B, provides a recent example of applying this human-centered approach to an existing problem in order to create an innovative, profitable solution. Limited parking spots and long checkout lines, especially on the weekends, were proving to be deterrents for customers, and grocery delivery services such as Amazon were becoming more appealing to customers when compared to the idea of grocery shopping on a busy day. To solve this problem of turning over customers to competitors, H-E-B employed a human-centered, innovative solution in the form of H-E-B

Curbside. The new service allows customers to order their groceries online and dictate their pick-up time, with the only downside being a nominal fee. When the customer goes to pick up their groceries, they are assigned a parking spot near the store entrance and the groceries are delivered to the customer's car. This service is widely used and popular among H-E-B customers. It is profitable because customers value the service, as it is based upon the exact needs of the customers.

How Does Design Thinking Work?

Though design thinking (the methodology) is not new, the term design thinking became popular only in the early 2000s, thanks chiefly to the design consultancy IDEO. The introduction of IDEO's The Field Guide to Human-Centered Design reads, "Human-centered design offers problem solvers of any stripe a chance to design with communities, to deeply understand the people they're looking to serve, to dream up scores of ideas, and to create innovative new solutions rooted in people's actual needs" (IDEO, 2015). To augment its income from designing products, the leaders of IDEO realized that its methodology could be used not just for product design, but also for business consulting more generally. Therefore, the leaders at IDEO pitched themselves as practitioners of a rational, systematic, or even "scientific" method, which in turn popularized the term, design thinking. Existing companies such as IBM and McKinsey have since created design departments within their operations. They operate as their own design firms within the larger businesses and have adapted design thinking methodologies to their own practices. IBM Design functions to help ensure human-centered products are being developed throughout all of IBM.

McKinsey Design functions as a branch of consulting, where McKinsey will help other companies adopt a more design-centric approach throughout all levels of business. Other design firms, such as frog, which was founded in 1969, had been using the same methods, but IDEO popularized design thinking to the masses. Additionally, other design firms such as Idean were founded after IDEO popularized this model of business. Within each of these businesses and firms, a nuanced variation of design thinking was defined, packaged, and sold. At the core of each of the design thinking definitions, or toolkits, they are all saying the same thing, but there are variations among the order of the steps, as well as the number of steps, and this likely causes the confusion. I attribute the cloudiness of the term design thinking to the multiple definitions that these large businesses have marketed.

Throughout my experience using the variations of design thinking taught in my courses and researching supplemental versions, I have determined what I think are the fundamental steps of design thinking. I have given each step the most-descriptive name in order to convey each step's purpose efficiently. Across the existing variations, design thinking involves roughly the same six steps: (1) problem definition, (2) user research, (3) synthesis, (4) ideation, (5) prototyping, and (6) iteration. Each variation may use different terms and may include additional or fewer steps, but the six steps listed above are the essential elements of design thinking. Some tools and methods that accompany these steps and that are used by many of the businesses as well as independent design thinking practitioners include: journey mapping, empathy mapping, persona and archetype development, intercept and contextual interviewing methods, AEIOUY observational frameworks, and more. There are different names given to these tools sometimes, but

essentially, they are tools that help the design thinking practitioners learn more about the user and develop maximum empathy for the user. Before design thinking practitioners begin to make anything, they must have a deep understanding of the needs, routines, behaviors, pain points, and triggers of the user they are designing for. The tools are meant to guide the practitioner in questions that help to grasp this understanding.

The chart below shows how the steps of six well-known design thinking methodologies align (or do not align), and how their nomenclature differs. Even though they have different names and different numbers of steps, and they call the steps by different names, they are still basically variations on the same theme. I explain each step below under the names of the steps that I have assigned as the model for the thesis.

Alignment of the Multiple Variations of Design Thinking Methodologies

Model for Thesis	*Problem Definition*		*User Research*	*Synthesis*	*Ideation*	*Prototyping*	*Iteration*	
frog	Clarify Your Goal	Build Your Group	Seek New Understanding		Imagine More Ideas	Make Something Real		Plan For Action
NYC	Set the Stage		Talk With People	Connect the Dots		Try Things Out	Focus on Impact	Get More Help
d.school	Define*		Empathize*		Ideate	Prototype	Test	
IDEO			Inspiration		Ideation	Implementation		
Idean	Discover the Right Opportunity				Define the Right Solution	Refine the Right Design		
IBM Design			Observe	Reflect		Make		

** = these two steps are flipped in terms of order, but are aligned in order to fit with the grouped columns*

Furthermore, for the sake of explaining the design thinking methodology in a tangible manner, I will use the same design problem throughout the next section: the mass consumption of fast fashion, especially among young people (ages 18-26). For background and clarity, fast fashion is a word that describes clothes that are mass produced at a fast rate in response to the ever-changing fashion trends and are sold at unbeatable, cheap prices. The fashion industry is the second most-polluting industry in the world only after the oil industry (Sustain Your Style). The primary users are young people who represent the largest consumers of these products because they are highly price-conscious and fast fashion answers to their needs for a cheap price tag.

Problem Definition

In the problem definition stage, the design thinking practitioner from any professional background identifies the problem worth solving and then accurately and succinctly defines it. The problem definition must be narrow enough to provide direction, but also must be abstract enough to allow room for creativity. Nearly all of the variations begin with defining the problem as the first stage, except for the d.school. The d.school first calls on the practitioner to empathize, and then define the problem, in two separate, consecutive steps. In this variation, the practitioner is to draw upon their findings from empathizing stage in order to scope and define a meaningful problem statement. With Idean, the first step is to "Discover the Right Opportunity" and it is a combination of the d.school's first two steps. Idean calls for the practitioner to, "empathize with your users, team, and stakeholders...Then synthesize these insights into a design brief where the

opportunity is clearly outlined" (Clouin et al., 2019: 40). The City of New York and frog's methodologies for the problem definition stage are quite similar. The City of New York calls it "Setting the Stage" and frog calls it "Clarifying Your Goal." In both, they call upon the practitioner to gather as much data about the ecosystem of the problem and then specifically in the frog approach, it calls practitioners to, "agree on the problem you're trying to solve and what goals you want to achieve" (Fabricant et al.). Furthermore, following the problem definition phase, frog's design thinking toolkit emphasizes the "Build Your Group" stage, which calls for careful team building before moving on to further stages. This is likely in order to ensure the team is comprised of professionals with the necessary expertise. The problem definition phase across the variations is about learning about the problem (and to some extent also the people you are solving it for), and in most cases, landing on a defined problem that you can return to for alignment at any future stage of the project.

Given the problem of fast fashion and the users as young people ages 18-28, the problem is most likely tied to the fact that young people do not possess a large disposable income to invest in their wardrobes, and therefore resort to buying cheaper clothes, which due to inferior quality and identification with a fleeting fashion trend will soon become a part of the waste/refuse cycle (this assumption will later need to be validated in the user research phase). So, even though young people may or may not care about the environment and sustainability, these fast fashion brands and their low prices appeal to them and suit their immediate need of buying trendy clothes at low prices. The first step is to figure out if young people are motivated to change their habits in order to be more sustainable.

Assuming that assumption is validated through preliminary research, the design prompt could be posed as: How might we both incentivize and hold young people accountable for making more sustainable clothing choices?

User Research

In the user research phase, the practitioner observes and attempts to learn as much as possible about the user's habits, needs, and pain points in the context of the problem they are solving. As mentioned previously, the d.school puts this step before the problem definition phase and Idean combines both the problem definition and user research steps into what they call the "Discover the Right Opportunity" phase. However, in all of the other variations, user research follows defining the problem. For the City of New York, their user research step called "Talk With People" is the most important stage of the practice, according to their manual. In their manual, they write: "Taking time to talk one-on-one or in groups with the people who use, deliver, and govern your service is possibly the most crucial step you can take towards improvement...You're talking with people to find out not just what's working and what isn't, but to better understand their fears, aspirations, and goals—things you'll never fully unearth in a survey" (New York City Mayor's Office for Economic Opportunity). Similarly, in IBM's version of this phase that they call "Observe," it stresses the need to gain a deep understanding of the users in order to produce meaningful solutions (IBM Design, 2018). In their toolkits, both IDEO and frog provide extensive methods of going about the user research. The user research phase is arguably the most unpredictable and for that reason, the most difficult. The tools include how to conduct

different types of interviews, including contextual interviews, intercept interviews, expert interviews, group interviews, surveys, and more. Furthermore, in IDEO's toolkit, they outline many methods for more creative ways of extracting data and insights from users. Among these creative methods are card sorts, which entail creating a deck of cards with images related to the problem and having the user sort them by different prompts of preference (IDEO, 2015). Methods like this supposedly help team members get into the mindset of the users at a rapid rate. It is also important to document all of this research along the way. In frog's toolkit, they provide guides for two activities that help to keep the design team aligned through the process of gaining all of this research and make sure it sticks throughout the rest of the project. The first method is called "We Saw, We Heard," and involves all of the team members recalling the top 3-5 things they learned in the research phase. It encourages practitioners to turn these ideas into sketches with captions (Fabricant et al.). The second method is called "Pattern Quest" and involves everyone bringing their notes from the user research and extracting observations from the notes and then grouping the observations as patterns arise and creating insights out of the emerging patterns (Fabricant et al.). These are methods of debriefing and aligning the design team and are crucial in the user research phase in order to keep moving forward.

In the user research phase for the example prompt of fast fashion, the design team would first identify the stakeholders and different target users. From there, they would identify which research methods to use and begin scheduling interviews. Helpful tools could include contextual interviews, where the team watches how the interviewee shops online or in stores and is able to ask questions along the way. Additionally, the team could

conduct an online survey that could yield a large quantity of responses. Depending on the questions, this would help the team identify shopping habits and preferred methods and brands for shopping. The team could also look to subject matter experts on sustainable fashion in order to get a better idea of the scope of the issue and potential avenues for change. Along the way, the team would ideally debrief after conducting each interview and document the interviews extensively through notetaking and photography in order to refer back to at later stages of the practice. It is important to note that there will always be an infinite amount of research to conduct and people to talk to. Therefore, the team should set goals at the beginning of the stage in order to track progress. Once the team has met their goals and revealed enough insights about the users and the problem, they will move into the synthesis phase.

Synthesis

After conducting user research, the team must synthesize and compile all of the insights to find patterns in the research. For the City of New York, the phase after user research, is known as "Connect the Dots," and it slows down the process in order to digest all of the research and to revisit all of the notes, find patterns, generate insights, map the user's journey, and "define a theory of change" (New York City Mayor's Office for Economic Opportunity). Debriefing and synthesizing all of the research after the user research phase is crucial before ideation in order to ensure the research is being translated to the ideation and prototyping phases. Oftentimes, it is difficult to refrain from ideating before synthesizing the research is complete. This is likely why the City of New York's method

calls out the additional "Connect the Dots" step in between the research phase and the ideation and prototyping phases. Furthermore, IBM's toolkit refers to the synthesis phase as "Reflect" and describes their version of synthesis as, "Coming together to reflect on our observations helps us synthesize and analyze findings, building a more nuanced understanding of our users across the team" (IBM Design, 2018). None of the other versions of design thinking specifically call out the synthesis phase, but synthesis is implied in combination with other steps. However, I argue that synthesis is crucial enough to call-out in an extra step in order to identify the most important patterns to return to throughout the rest of the design thinking process.

In the fast fashion problem, the team now must come together in order to review and externalize the findings from the user research phase. Through this process, the findings will condense into patterns that will inform the next stages. After speaking with subject-matter experts and different types of shoppers within the target age range, some emerging themes from the research are that young people are widely unaware of the negative impact of the fashion industry on the environment, young people are highly sensitive to price, and young people are open to making changes in their habits to lessen the impact on the environment. Given these insights, the team may begin ideating potential solutions.

Ideation

Ideation is one of the more exciting stages of any project but it is a stage that should only be undertaken after proper preparation. Once the team has identified the patterns, it

can then begin ideating on the patterns that have risen to the top. In the ideation stage, the practitioner will continue making insights from the user research phase and then turn these into actionable ideas. All of the organizations' variations of the design thinking methodology have a distinct phase for ideation. At frog, it is called "Imagine More Ideas," at the d.school it is "Ideate," at IDEO it is exactly "Ideation," and at Idean, they call it "Define the Right Solution." However, regardless of the nuances between the six variations in focus, this stage is all about quantity of ideas over quality and externalizing as many details as possible. In externalizing, the practitioners write or sketch all of their ideas on pieces of paper (or Post-Its). Externalizing ideas, no matter the quality is meant to generate increasingly novel ideas. In IDEO's toolkit, they provide multiple tools for continuing to externalize research insights (Download Your Learnings, Share Inspiring Stories, Top Five, Find Themes, Create Insight Statements), tools for transitioning into brainstorming (Explore Your Hunch, How Might We's, Create Frameworks), and tools for producing masses of ideas for action (Brainstorm, Bundle Ideas, Get Visual, Mash-Ups, Create a Concept, Co-Creation Session), and even gets ahead into tools for prototyping (Storyboarding, Role Playing, Rapid Prototyping) (IDEO, 2015). Similarly, Idean uses tools such as Crazy Eights, Storyboarding, Dot Voting, and Roleplaying to accumulate as many ideas as possible in their "Define the Right Solution" phase (Clouin et al., 2019). All of these tools are prescriptive but leave room for discretion in choosing which methods apply best to individual design projects. In the d.school's design thinking manual, they emphasize the value of quantity in this phase: "Ideation is a process of 'going wide' in terms of concepts and outcomes—a mode of 'flaring' instead of 'focus.' The goal of ideation is to explore a

wide solution space—both a large quantity and broad diversity of ideas" (Doorley et al., 2018). The more ideas that the design team is able to externalize, the more non-obvious, and potentially "winning" concepts they will land upon. In the frog toolkit, they succinctly phrase this by saying "more ideas mean more opportunities for a great solution to emerge" (Fabricant et al.). One of the great values of the design thinking method is that it democratizes the act of designing things. The tools in which a designer needs to go through the method are rather affordable. The most expensive aspect of the method is time, and perhaps a skilled facilitator to lead people through the process. Tools such as sticky notes (or mere pieces of paper), pens, and a surface to work on go a long way with ideation.

The goal of design thinking is to yield human-centered products and services. Design thinking advocates claim that the process of design thinking fosters an innovative mindset through using the creative-problem solving methods and tools of design thinking, which favor quantity over quality, especially in the ideation stage and promote the tendency to "fail fast." Furthermore, design consultancies say that design thinking is best-suited towards open-ended problems rather than problems that call for a conclusive and definite answer. Tim Brown, the Co-Founder, CEO, and President of IDEO applies this in comparing the design problem: "how might we design a better voting machine" to: "what would be a better way to enhance the democratic experience" (Brown & Katz, 2019). He writes, "When we focus on nouns, we lock ourselves into an incremental mindset: a better toothbrush, a more comfortable desk chair, a quieter air conditioner. But when we think about verbs, we blow the roof off the problem and are able to approach it in all of its wicked complexity, which has always been the condition of real innovation" (Brown & Katz,

2019). The latter is more effective because it does not limit the design opportunity to the voting machines but opens the question to the entire experience of the process of voting. Naturally, questions that are more open-ended allow more room for innovative solutions.

Going back to the design problem of fast fashion for young people, in the ideation phase, the team will start ideating potential solutions based on the synthesized findings. For example, we said that some emerging themes from the research are that young people are widely unaware of the negative impact of the fashion industry on the environment, young people are highly sensitive to price, and young people are open to making changes in their habits to lessen the impact on the environment. In the ideation phase, the team may come up with ideas such as tagging unsustainable brands' clothing with an unremovable and visible tag, informing the user of the "cost per wear" of the articles of clothing they are shopping for, tracking how much the user spends at each brand and informs them of their habits, or creating a browser plug-in that informs the user of the sustainability of the site they are shopping on. All of these ideas must be externalized and put into words and sketches and expanded upon with any number of the tools that the design thinking toolkits suggest. For example, if the design team used the Dot Voting activity that Idean suggests, the team would lay out the sketches of all of the ideas on a table and vote with dots on their favorites. This may reveal that there are some ideas that the team should prioritize. Additionally, the team could use IDEO's Mash-Ups exercise. In this exercise, the team combines any number of the ideas on the table to create more ideas. For example, the team could combine the "cost per wear" idea with the browser plug-in idea, so the new idea is that while the user shops, the browser informs them via plug-in of the sustainability of the

brand, as well as the cost per wear of the item they are interested. This answers young people's need of having access to more information about the sustainability of the brands they are shopping at, while still being cost sensitive. The cost per wear feature would potentially reveal that the cheap prices of fast fashion brands may be short term, as the articles of clothing are short-lived. The ideation phase will continue and new ideas will keep emerging, but now it is time to start testing some of these ideas on the users.

Prototyping

The prototyping step uses the concepts that were generated in the ideation stage and turns them into tangible, actionable items that are then returned to the users in order to test them. The value of a prototype is that they allow for low-risk testing before the team commits to producing something of a greater cost or time commitment. Prototypes come in every level of fidelity, from drawings on napkins to 3D-printed objects. Low-fidelity prototypes democratize the practice of designing and testing new ideas for people of all skill-levels of craft. In their three-step approaches to design thinking, IDEO, Idean, and IBM combine prototyping and iteration into the same step. IDEO calls this the "Implementation" phase, it is Idean's "Refine the Right Design" step, and IBM's "Make" phase. However, they all stress the importance of testing multiple prototypes and iterating and refining the solutions as new information arises during testing. In IBM's description of the "Make" stage in their design thinking how-to, they remark that, "Rapid, low-fidelity prototyping allows us to simulate ideas and test hypotheses quickly and cheaply. The end result: solutions that are robust, effective, and battle-tested" (IBM Design, 2018). The low cost of prototyping in

low-fidelity formats is valuable to business and can move ideas further with little to no cost. The City of New York breaks down the different methods of low-fidelity prototyping where they suggest prototyping with storyboarding, words, paper, and simple digital tools (New York City Mayor's Office for Economic Opportunity). Similarly, frog's toolkit emphasizes storyboarding through sketches and captions, as well as performing ideas through acting within the design team and creating analogies to better describe ideas for potential implementation (Fabricant et al.). The d.school focuses on the tangibility of the prototypes because, "Prototypes are most successful when people (the design team, users, and others) can experience and interact with them. They're a great way to start a conversation" (Doorley et al., 2018). Therefore, in addition to the sketches, captions, analogies, and performances, prototypes that you can hold and interact with likely will yield richer feedback from the users.

Now we return to the fast fashion problem. The team is excited about the plug-in idea that informs the user of the cost per wear of the unsustainable article of clothing in comparison to the more sustainable options. They would first like to test this idea out with the users. One way they could prototype this idea is through performance, as outlined in the frog toolkit. One person could act out the user and the other person could be the computer reacting to where the user clicks. Another way to prototype this idea is with a paper prototype that has representations of a computer screen through drawings of buttons and drop-down menus. The team could ask the user to interact with the "screen" in the way they see best-fit and gather information through that. There are other simple digital tools that can be used to create wireframes, which can then be tested on users as

well, perhaps as a second version after the paper prototype. The amount of thought that goes into the prototypes will pay off in the level of feedback that the team gets in return. From here, the team continues repeating the process of developing prototypes and testing them on users.

Iteration

The practitioner is already naturally led into the iteration phase, where they continue to prototype, test, and validate their ideas until a they reach a comprehensive solution. As mentioned previously, IDEO, Idean, and IBM combine this iteration step with the previous prototyping stage in their three-part approaches to the methodology. The d.school's methodology has the closest-defined final step to iteration, and they call it the "Test" stage. "The test mode is an iterative mode in which you place low-resolution prototypes in the appropriate context of your user's life. Prototype as if you know you're right, but test as if you know you're wrong" (Doorley et al., 2018). The final step as prescribed by the d.school encourages refinement and continual testing. In the City of New York's methodology, the step most-closely related to iteration is called "Focus on Impact" and stresses identifying a final solution and developing services, programs, policy, communications, and digital products to enhance the final solution. This makes sense, as the City of New York's methodology is meant to impact public services, and these services are tied to policy and communication for guiding the public through new and different services.

The final steps for frog and the City of New York focus more on how to move forward as a team. In frog's methodology, they label the final step "Plan for Action" and it focuses on project management-related functions: agendas, timelines, assigning specific people different tasks, and maintaining momentum (Fabricant et al.). In the City of New York's methodology, they call the final step "Get More Help" and this step calls upon the team to realize what expertises they are missing in order to bring their idea to life. If the team did not already have a skilled designer and the solution called for building a compelling and easy-to-use user interface for a public transportation system, they would most likely need to get more help from user interface designers.

Going back to the fast fashion design problem, the iteration phase will naturally progress from the prototyping phase. Iteration and idea refinement continue until the team is confident that the solution reached solves the initial problem and answers to the user needs that were discovered along the way. Ideally, the final solution in the context of the fast fashion problem will incentivize and eventually change the habits of young people to make more sustainable fashion choices. This was an actual problem that I worked on with a team and the final solution was a Google Chrome plugin nested in the browser bar. We added different features based on user feedback, such as a color-changing icon (red, yellow, green) depending on the website the user is on, when it relates to shopping. The plugin informs the shopper of the cost per wear of the articles of clothing they are browsing for and provides more sustainable choices if they are currently looking at unsustainable options. The solution will eventually expand into an app that gives location-based shopping suggestions based on sustainability and has a community aspect where users can share

recommendations and reviews. Ideally, the platform will grow to include furniture, appliances, and other textiles, if the clothing-based platform gains enough momentum. Design thinking was applied throughout the duration of the project and the solution that was reached would not have otherwise surfaced if we did not follow the steps of the methodology and work on a team of diverse disciplines (Design, Economics, Humanities, and Advertising).

Reflecting on these six steps, there is something missing. In comparison to creative disciplines such as art, architecture, and design, the design thinking methodology is lacking critique. Design professional Natasha Jen points this out in her speech titled "Design Thinking is Bullsh*t." She points out that nowhere in the six steps of design thinking is there instruction for critique. She says, "I think that as designers or anybody who has anything to do with design, we got to be really critical of it" (Jen, 2017). She goes on to talk about how design thinking is simple intuition, but the form it takes (on 3M Post-its) does not allow for a very messy, natural design process. She continues, "Messy evidence is not this kind of five step, linear hexagon based process. So, my challenge to design thinking practitioners is to really share the evidence and the result and the outcome that you have produced and allow us to critique and to comment on it and to really kind of see where we can go from design thinking" (Jen, 2017). She notes how her design office at Pentagram displays every piece of work and it is all up for critique. She says this is the most important step in design, as it is where the most improvement happens. And if critique is missing from design thinking, she argues that the solutions will always be lacking in their full potential. Perhaps critique could be incorporated more intentionally into the iteration

phase and this could lead to more of a participatory process with users. There is certainly room for improvement in defining the design thinking methodologies and the design thinking toolkits from the different versions discussed.

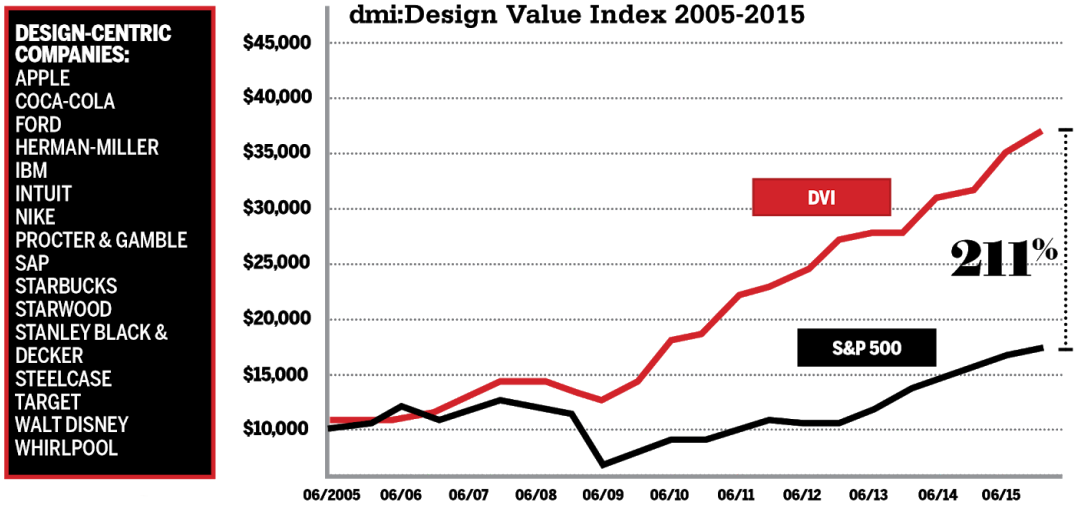
Why is Design Thinking so Popular Today?

Due to the widespread infusion of human-centered design in services and products, such as the iPhone, consumer expectations are on the rise. The following reports prove why it has become increasingly more important for companies to adopt and integrate design throughout all levels of business. Design thinking is difficult to define and can be difficult to quantify due to its abstractness and lack of metrics largely in use to track its success. However, several institutions such as the Danish Design Center, the Design Management Institute, and McKinsey & Company and have published reports on the economic value of design and provided different metrics to track design in relation to business performance. The following reports arguably further muddle the term "design" with "design thinking" and "design strategy," but provide an explanation for why design thinking has become a buzzword in business and academia. The final outcome of the design thinking methodologies, which yields ideas grounded in research, are a blueprint for what a designer can then bring to life. The distinction is difficult to identify in many cases, and therefore the final product is often attributed completely to design thinking or completely to design, when it is actually a two-part process. This is likely why the terms are cloudy in the following reports, but also why design thinking has gained momentum and credit for design in many cases.

In 2003, the Danish Design Center (DDC) compiled a report for the Danish National Agency for Enterprise and Housing that investigated the economic value of design. The DDC defines "design" in the report as "design strategies, development, and styling" (Danish Design Center, 2003: 3). It is worth noting that this definition muddles the term "design" with more the business-related terms of "strategy" and "development." The DDC conducted telephone interviews with 1,074 Danish companies with at least 10 employees and asked questions relating to their investment in design, including how much they invest on design services internally and externally, as well as the types of design training they provide employees (Danish Design Center, 2003: 8). With this information, they ranked all 1,000 companies on the "design ladder" and compared the design ladder rankings to business metrics, such as gross revenue and export performances over a 5-year period. The report found that nearly 50% of Danish companies purchase design either internally or externally and the total investment in design in Denmark is between Danish kroner (DKK) 1.6–2.4 billion annually (Danish Design Center, 2003: 33). Furthermore, they observed that as companies increased their commitments to design, they experienced an average increase in gross revenue of DKK 3 million and companies who employ a systematic approach to design have an increase in exports that is double the size of companies who do not employ design (Danish Design Center, 2003: 33–34). The report concludes that there are strong correlations that prove how design benefits companies through profits, as well as consumers through more delightful products and services, yet more research is to be done as the trend of design in business increases even more.

The Design Management Institute (DMI) compiled reports in 2013, 2014, and 2015 relating to the Design Value Index (DVI). The DVI is a market index that the DMI uses to track how design-centric businesses compete in comparison to the rest of the S&P 500. In the 2015 report, the DMI identified 16 publicly traded companies as design-centric, as seen below in the graph from the DMI (Rae, 2015: 5). In the 2015 report, the DVI shows a 211% return over the S&P 500 (Rae, 2015: 5). The companies included in the DVI exemplify the "best-in-class design management practices," which are outlined as the following five attributes: (1) design operates at scale across the enterprise, (2) design holds a prominent place on the company organizational chart, and either sits on the leadership team or directly reports to a leadership team member, (3) experienced executives manage the design function, (4) design sees a growing level of investment to support its growing influence, and (5) design enjoys senior leadership support from the top tier of the organization (Rae, 2015: 6). The DMI underlines the economic value of design practices in large companies, and over the years have seen an increase in other companies adopting design practices due to the economic values.

Chart from the Design Management Institute's 2015 Design Value Index Report



McKinsey & Company published a report in fall of 2018 titled *The Business Value of Design* and it builds upon the evidence in the DMI's report by reinforcing the economic value of design through research and metrics. The report utilizes the McKinsey Design Index (MDI), which assigns values to 300 public companies based on their design dexterity over a 5-year period and compares the MDI to the financial performance of each company. One of the conclusions the report comes to is that, "Higher McKinsey Design Index scores correlated with higher revenue growth and, for the top quartile, high returns to shareholders" (Sheppard et al., 2018: 8). The four most important "design actions" that McKinsey's report revealed to improve financial performance are: (1) measuring and driving design performance with the same rigor as revenues and costs, (2) breaking down internal walls between physical, digital, and service design, (3) making user-centric design everyone's responsibility, and (4) de-risking development by continually listening, testing,

and iterating with end-users (Sheppard et al., 2018: 11). If companies started using more design metrics, such as usability assessments and satisfaction ratings in conjunction with other business metrics, the economic value of design would become much clearer in a business sense. The McKinsey report further proves the economic value of design in business.

Critiques of Design Thinking

There are many design thinking advocates in the world, namely the businesses and schools who are spreading the methods and yielding profits from doing so. Conversely, there are design thinking skeptics who see many fundamental issues with the practice. The skepticism ranges from perceived issues on the surface-level to passionately averse opinions, like the famous statement made by design educator Lee Vinsel, who argues the following: "While Design Thinking is mostly just vapid, I will argue that, via illicit connections, this fad could spread through the nation—possibly even the world—and that, kind of like syphilis, if Design Thinking goes left untreated, it eats your mind" (Vinsel, 2017). While he writes in a satirical manner, he strikes a chord with a lot of designers and has since raised many debates regarding design thinking.

Design Thinking Has a Definition Problem

There is a lot of confusion about what design thinking is, and how it does (or does not) relate to design, and what it is useful for. Lee Vinsel contends that, "The deeper you dig into Design Thinking, the vaguer it becomes" (Vinsel, 2017). Lucy Kimbell explains the

cloudiness and confusion surrounding these two terms by saying "It's hard enough understanding design and thinking, let alone design thinking. So it is not a surprise that those who support its application to business or more broadly to public services or social problems, have trouble articulating what it is, whether all designers can do it, whether it is something new or just a different name for what good designers have always done, and why it might be a good thing that non-designers can learn it and do it too—or perhaps they do it already" (Kimbell, 2011: 288–289). She notes that the field of design is difficult to define because it is so diverse, but this indefinite definition may lead to misinterpretations of what professional designers do and what design activity entails. Kimbell tries to better define "design activity" in order to "highlight the practices that constitute designs, designers' work, and their expertise" in contrast to the now-widely popular design thinking that is often mistaken for design activity (Kimbell, 2012: 131). This is an important distinction because Kimbell notes how design thinking descriptions typically refer to what designers do and subsequently reference the tools they "use, make, and work with" (Kimbell, 2012: 134–135). Therefore, better definitions outlining the field of design, as well as the methodologies of design thinking, would help in order to due credit to professional designers, as well as design thinking practitioners.

Design thinking is a creative problem-solving methodology modeled on the way that designers have traditionally solved creative problems, but it is not the same thing as design, and it is not a substitute for the talents of designers. Instead, it helps non-designers to think like designers and produce innovative ideas. But in order for the ideas to become tangible and usable, a skilled designer must still be involved. Design thinking is a process

used to develop ideas that drive products and solutions that meet human needs, and it can be learned quickly; in contrast, design is a craft or an art that cannot be reduced to a formula, and that requires years of study to do expertly. It is a discipline that one must either have a natural talent and affinity for or be trained and groomed for in an educational or professional environment. Designers extensively study subjects such as design history, typography, color theory, interaction design, etc. On the other hand, design thinking is a tool that non-designers without expertise in the craft of design can to use to emulate problem-solving strategy of a designer. But the results will not be polished unless there is a designer on the team.

When proven successful, design thinking yields an actionable idea. A designer by craft is then called upon in order to bring the idea to life. For that reason, whenever practicing design thinking, there will always be a need for a "design ninja" in order to bring a mere idea to life. This term, design ninja, was coined by Doreen Lorenzo, the Assistant Dean of the School of Design and Creative Technologies at The University of Texas at Austin, and former President of frog. Lorenzo comments on the need for "the designers, the people that are experienced in how to then take [change] to the finish line and do all the work that's necessary to make this stuff happen. You need experienced people that know how to get through the big hairy problems" (Ferguson, 2018). Therefore, design thinking is not something that is meant to replace design. Jon Freach discusses a common misconception about design thinking. Freach writes:

> These [design thinking] toolkits don't instantly make you a designer or guarantee mastery. Designing is a highly nuanced process that is shaped by one's exposure to a diverse variety of problems, the personal experience of understanding them and a

> history of creatively solving them. It takes time and instruction to build design cognition, a sharp eye and skilled hands (Freach, 2018).

Design is a craft and design thinking is an methodology. Design requires natural skill and continual practice and design thinking requires instruction and adoption of a new mindset. Design thinking does not have the capacity to replace the role of the designer, as design thinking does not teach craft. In this sense, the act of designing is a two-part act. Jon Freach points out how this has been misinterpreted in the past. He writes, "Design's value was often misunderstood as only providing a surface material or expression to something that had been engineered" (Freach, 2018). But design starts well before polishing the surface material. Design is the strategy and the usability of the product or service, in addition to the aesthetics. Design thinking integrates the role of the designer with the interdisciplinary team from the beginning of the process and also relies on the designer to bring the final idea to life. Tim Brown adds to this sentiment in saying, "While there is no designer who does not honor the artifact, designers today are learning to think not only in terms of stand-alone products but also of systems, the complex social networks of meaning, behavior, and power within which products are embedded" (Brown & Katz, 2019). In this sense, the scope of design has expanded from only looking at stand-alone objects to entire systems, and this shift calls for more diverse thinkers to join in on the design process.

My experience in design thinking courses also led to my ability to self-correct several misconceptions that my peers and I falsely believed about design thinking. In my own experience, many students who set out to take design thinking courses believe that they will come out on the other end as designers. However, after taking one course, I quickly realized that that is simply not possible. If you have never had a formal design

education, meaning you have never been educated in typography, graphic design, color theory, design history, etc., there is simply no way for you to somehow gain those crucial design skills by taking courses on design thinking. Design thinking is useful, but it merely produces *ideas*. As stated previously, design thinking is something that especially *non-designers* can utilize in order to think more like a designer in coming up with creative opportunities to solve for and creative solutions to those opportunities. Therefore, if you are not a skilled designer, at the end of the design thinking process, you will come out with a rich idea, but not necessarily a finished, packaged product.

Another misconception that I would like to dismiss is that design thinking makes the designer obsolete. As I have stated, there is no finished product, service, or experience at the end of the design thinking process. There is simply an idea and ideally some low-fidelity prototypes. Therefore, there will always be a need for designers to carry the team through the finish line and to actually bring the idea to life in a compelling fashion. For these reasons, I argue that design thinking is an incredible and beneficial tool for all fields, including design. It is also a tool that nearly every human will benefit from as a consumer, due to the methodology being centered around designing better things for humans.

Design Thinking Does Not Work for Every Problem

Another common opinion is that design thinking is an insufficient approach to solving the problems it promises to tackle. Amy Collier expresses her doubts relating to the design thinking methodologies: "In increasingly dark and troubled times, design thinking increasingly feels insufficient, superficial, and even silly...how far can design thinking really

take us in dealing with complex issues like structural racism, abuse of power, corruption?" (Collier, 2017). She doubts the sole ability of design thinking to tackle all that it claims it will due to the hollowness of methods. She writes, "I worry that its surface-level solutionism works against our willingness to dig into the real meat of problems" (Collier, 2017). Many design thinking critics also argue that many of the design thinking activities sound and feel like fun games, which may distract from the seriousness of the problems at hand. Lee Vinsel continues in this same regard in writing, "Design Thinking may have one time made sense in a specific context. The problem is that it is now being (over-)sold as a solution in so many other spaces, which leads to all kinds of ironies and silliness" (Vinsel, 2018). Perhaps if design thinking was given a tighter definition, reduced the level of structure in its prescribed activities, which are often the things perceived as being "silly," and lowered its standards of potential impact, then the methodology could someday be taken as seriously as the scientific method. Design professional and Co-Founder of IDEO, Bill Moggridge offers a rebuttal to this sentiment:

> [Design thinking] uses the subconscious as well as the conscious mind, subjective as well as objective thinking, tacit knowledge as well as explicit knowledge, and embraces learning by doing. I like the analogy of an iceberg that has just a little ice above water level, with a vast mass submerged. Rigorous explicit thinking, of the kind encouraged in institutions of higher learning, limits people to conscious thinking and hence to using just a tiny proportion of the potential in their minds - like the ice above the water. The design thinking process allows us to follow our intuition, valuing the sensibilities and insights that are buried in our subconscious - like the ice below the water (Moggridge, 2010).

In this sense, design thinking is not the solution, but the enabler of better solutions. It unlocks capacities in the practitioners that would have otherwise remained unused, as I can attest from personal experience.

Many share the opinion that design thinking is not a one-size-fits-all approach to any design problem, and the answers it yields are only as good as the practitioners engaging in the process. *The Design Way* alludes to ancient times for anchoring the modern-day conversation of design thinking. I found this ancient-to-modern-day comparison to be particularly noteworthy:

> Ancient Greek decision makers would go to great effort to ask the Oracle at Delphi for a simple answer to their straightforward question, only to be given responses that, by necessity, required deeper thinking on the questioner's side. The early Christians found that their leader spoke only in parables, leaving centuries of interpretation as to what the 'true' answers were. Despite the popularity of these traditional sources of wisdom, decision makers have continued to look for other means of inquiry that will provide information that is more accessible, straightforward, accurate, and consistent over time (Nelson & Stolterman, 2014: 30).

An example of this constant pursuit of easy answers is perhaps found in the large demand for design thinking in business. A business recognizes that their profits, innovation, or general morale is depleting and they need a quick fix, a panacea. So, they turn to the trendiest and shiniest new thing that comes nicely packaged with an easy-to-use manual, which is design thinking. Although, design thinking is merely the framework and not the solution. Just like the Oracle at Delphi, design thinking provides the starting point from which the practitioners must continue with critical thinking and problem solving. Furthermore, Kate Canales, the Chair of the Department of Design at the School of Design and Creative Technologies at The University of Texas references the design thinking toolkits that I discussed previously and notes that:

> These generalized tools can be really instructive and inspiring. . . But the application of the concepts is complex and frustrating and unique to circumstances that the authors could never cover for a massive, general audience. It's difficult to communicate nuance or guide a user through the inevitable unpredictability they will encounter in a real project using these kits alone. I think where they have been

> ineffective is anywhere that they imply that usage will lead to mastery (Freach, 2018).

The fact that a team or a business is using the design thinking methods does not guarantee a compelling solution. As far as being a one-size-fits-all solution, Huke explains how not every design problem can afford failure in multiple types of testing. Therefore, he writes, "When failure isn't an option, we go to the method that is the most definitive we know: the scientific method" (Huke, 2018). For this reason, the design problem at hand must be evaluated before the decision is made to use design thinking as the ultimate problem-solving method. It is one among many.

Conclusion

Since taking Introduction to Design Thinking, I have taken eleven other courses sponsored by the Center for Integrated Design, including off-site courses at IBM Design and McKinsey Design, as well as several one-hour introductory courses in subjects ranging from Future Studies to Visual Ethnography. With every class, I have gained new understandings about the implications of design thinking methodologies.

Design thinking as a methodology and a mindset for non-designers is an immensely helpful tool for people whose jobs require them to constantly innovate to generate new intellectual property and to respond to the needs of consumers and the public. These non-designers are people who likely have not practiced creativity in many years and a three to six step, prescribed approach to unleash their creativity is what it takes to unleash creative problem solving. Therefore, I believe that this paper would read just as clearly if I substituted the phrase "creative problem-solving" for the term "design thinking."

Furthermore, the term creative problem-solving is arguably more descriptive term and one that would generate far less confusion than the term design thinking has.

Design thinking democratizes the field of design in order to spread the value of human-centered design to more fields and is a scalable and teachable method that educates non-designers in thinking about human needs. The spread of design thinking into fields such as engineering, natural sciences, business, and even social sciences provides a supplemental method to these fields that professionals can take action with. There is a clear demand for design thinking in schools and business. Students and business people are using what is called a "desire line" straight to these design thinking courses, workshops, and consulting services. There is proof that design thinking is filling a widespread need, whether design thinking is the short-term or long-term solution. Design thinking very well may be the temporary solution to the need for a way to teach people how to be thinking creatively. And for all of the students and professionals hoping to enroll in design thinking courses or bootcamps, I wish to dispel the common beginner hopes of gaining skills in design craft.

Design thinking is not new. It is exactly the way creative people and problem solvers have solved problems for centuries, if not longer. It is a creative problem-solving methodology based on the scientific method but used to produce things that satisfice rather than to discover truths. It can be incredibly helpful as a framework, especially for non-designers, for solving problems that require creative thinking. Having a nicely packaged method to use whenever needed, especially when the people sitting around the table come from different areas of expertise and use different jargon, is an incredibly

helpful tool for aligning teams of interdisciplinary people with a shared vocabulary and set of methods, while producing novel ideas. However, design thinking does not work for every problem, nor does it guarantee good results. Those results depend on the scope and nature of the defined problem and the make-up and chemistry of the design thinking team, as well as their commitment to using the prescribed design thinking methods in an earnest manner.

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Biography

Madeline Goulet was born in Austin, Texas on January 10, 1997. She has two siblings, Emily and Jack, and four step-siblings, Ian, Aidan, Chloe, and Chelsey. She entered The University of Texas at Austin in the fall of 2015. In college, she competed on the Women's Varsity Rowing team for her first three semesters, worked as an intern at The Panacea Collective from 2016-2019, and studied abroad in the spring of her junior year at the University of Copenhagen in Denmark. She graduated in May 2019 with a Bachelor of Arts in Plan II Honors and a Bridging Disciplines Program Certificate in Design Strategies.